PART D. GROUNDWATER MONITORING AND ASSESSMENT

D.1 Groundwater Resources in Montana

The quality and availability of groundwater varies greatly across Montana. Aquifers in western Montana are typically in unconsolidated, alluvial valley-fill materials within intermontane valleys. The intermontane valley aquifers often yield relatively large quantities of high-quality water to relatively shallow wells. Fractured bedrock aquifers surrounding the intermontane valleys are becoming important because many wells are being constructed in these aquifers as development encroaches on the edges of the major valleys.

Residents in eastern Montana commonly obtain groundwater from aquifers occurring in unconsolidated, alluvial valley fill materials, glacial outwash, and consolidated sedimentary rock formations. Consolidated formations that are most commonly used as aquifers in eastern Montana are the Fort Union, Hell Creek, Fox Hills, Judith River, and Eagle formations. In some areas east of the Rocky Mountains, large areas of near-surface thick shale deposits such as those of the Colorado Group and Bearpaw (Pierre) Shale severely limit the economic availability of water to wells or provide water of too poor quality for most uses. Eastern Montana aquifers typically yield less water than those of the west, and the water generally is more mineralized. The water in some eastern aquifers is suitable only for livestock consumption.

Groundwater Use

Montana’s population relies heavily on groundwater. More than 196,000 wells are documented by records at the Montana Ground Water Information Center (GWIC) application. Since 1975, Montanans have constructed 84,500 wells claiming domestic use, 13,100 wells claiming stockwater use, and about 6,500 wells claiming irrigation use. About 75 percent of Montana’s population uses ground-water for drinking; about 26 percent of the population obtains drinking water from private wells.

Groundwater sources provide 2-3 percent (about 188 million gallons per day [mgpd]) of the 8,290 total mgpd of the water used in Montana.[89] The largest uses of groundwater are:

- ❑ drinking water supplies – 73.4 mgpd
- ❑ irrigation – 83.0 mgpd and
- ❑ industrial – 31 mgpd.

Groundwater is also extensively used to water stock. The intensity of water use is heaviest in the west where most wells for domestic purposes are drilled and high-yield aquifers will support irrigation. Stockwater use is common throughout Montana but is prevalent in eastern counties where ranching is an important industry.

Groundwater Characterization and Monitoring

The 1991 Montana Legislature established the Montana Ground Water Assessment Program (GWAP). Through this program it directed the Montana Bureau of Mines and Geology (MBMG) to characterize Montana's hydrogeology and to monitor long term water-level conditions and water chemistry. The **Characterization Program** is designed to systematically evaluate Montana’s aquifers. The **Monitoring Program** is designed to collect long term water-level and water-quality data. The **GWIC** (http://mbmggwic.mtech.edu) holds and distributes data generated by the Characterization and Monitoring programs, and also data generated by many other groundwater projects.

Ground Water Characterization (GWC) has visited more than 6,000 wells in 18 Montana counties. The site visits provide high-quality inventory information about the ground-water resource within each study area. GWC atlases for the **Lower Yellowstone River** (Dawson, Fallon, Prairie, Richland, and Wibaux counties) and the **Flathead Lake** (Lake and Flathead counties) areas have been released. The atlases include descriptive overviews of aquifers and 21 maps describing the ground-water resources. Fifteen maps are in preparation or review for the **Middle Yellowstone River Area** (Treasure and Yellowstone counties outside of the Crow Reservation) and the **Lolo-Bitterroot Area** (Mineral, Missoula, and Ravalli counties). Field work has been completed in the **Upper Clark Fork River** (Deer Lodge, Granite, Powell, and Silver Bow counties) and **Clark’s Fork of the Yellowstone River** (Carbon and

[89] Hutton, S., Barber, N., Kenny, J., Linsey, K., Lumia, D., and Maupin, M., 2000, Estimated Use of Water in the United States in 2000, U.S. Geological Survey Circular 1268, 46p.

Stillwater counties) areas and begun in the **Giant Springs** area (Cascade and Teton counties). The Ground-Water Assessment Steering Committee has scheduled the **Missouri Headwaters** (Gallatin and Madison counties) and the **Upper Yellowstone River** (Sweet Grass and Park counties) areas for future work. The Ground-Water Assessment program expects to begin work in the **Missouri Headwaters** area (Gallatin and Madison Counties) in the spring of 2008.

The Monitoring program's statewide network contains 883 wells in which static-water levels are measured at least quarterly. Within the network there are 98 water-level recorders that provide hourly to daily water-level records. New water-level data for any well in the network are generally available from GWIC about 10 days after they were collected.

Groundwater Contaminants/Contamination Sources

Even with activity of the Characterization and Monitoring Programs, there is no comprehensive state-wide set of water chemistry data collected between July of 2001 and June of 2005. Ground- Water Assessment accounted for almost half (557 of 1,156) samples evaluated for this report. A little more than 300 samples came from Ground-Water Characterization studies in the Upper Clark Fork River area in Deer Lodge, Granite, Powell, and Silver Bow Counties and the Clark's Fork of the Yellowstone River area in Carbon and Stillwater Counties. About 260 samples were collected by the Monitoring Program from statewide monitoring network wells. MBMG projects around the perimeter of Flathead Lake, in northern Park County, and in the Musselshell River basin, among others, added more than 600 samples to the data set bringing the total number of sites to 1,156. Figure 11 shows the locations of the sampled sites and whether the samples were collected by the statewide monitoring program, the ground-water characterization projects, or other MBMG projects. Whether the well or spring was completed in an unconsolidated or consolidated aquifer is shown on Figure 12.

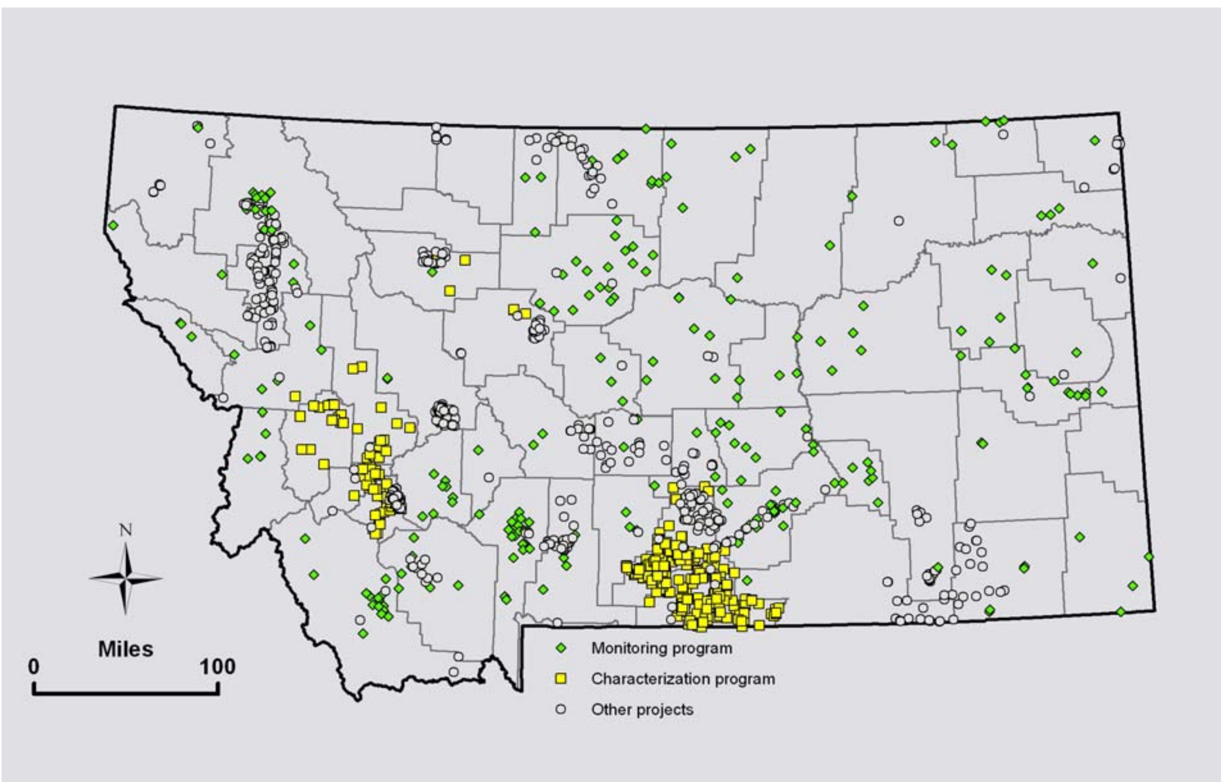

Figure 11. About 50 percent of the samples evaluated for this report were collected by the Ground-Water Assessment Program

To be included in the data set the water-quality analysis must have met these criteria:

- ❑ The sample must have been collected between July 1, 2001, and June 30, 2005

- ❑ The sample must represent "ambient" water quality (i.e. not collected as part of an effort to determine the extent of contamination by a parameter being evaluated here) and have an identifiable geologic source.
- ❑ The sample must have come from a well or spring.

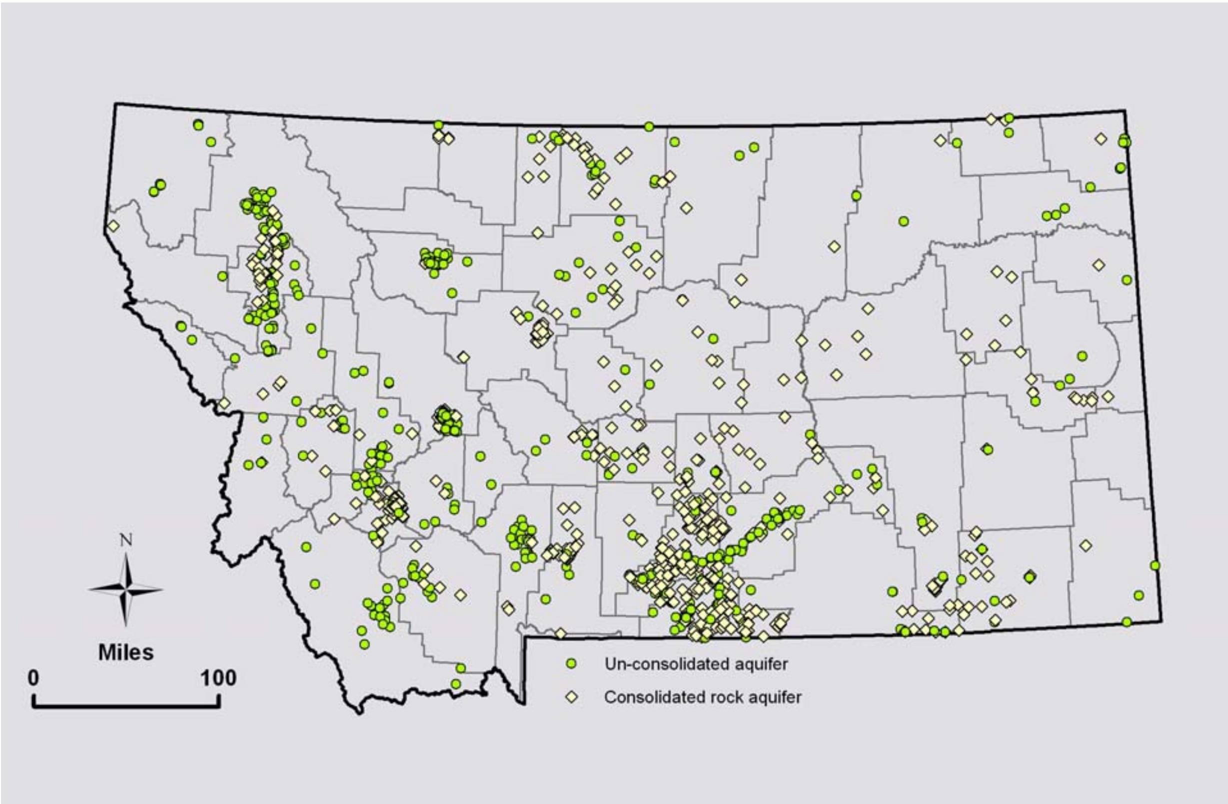

Figure 12. About 40 percent of the samples evaluated for this report came from unconsolidated aquifers.

If a well or spring was sampled more than once between July 1, 2001 and June 30, 2005, data either from the most recent or the most complete analysis were evaluated. For example, if a well was sampled for common ions (including nitrate) and trace metals, but later sampled for nitrate only, the complete analysis was retained and the single nitrate result discarded. Numerous samples collected from closely spaced wells also received special treatment. For example, 172 sites from an alluvial aquifer at the Montana Pole Site in Butte, Montana were sampled for common ions and trace metals. The Pole Site covers an area of less than two square miles and the number of samples over-represents the area in the unconsolidated aquifer group. The data were sorted by location and then by total dissolved solids. The analysis containing the median dissolved solids for the group located in section 23 and the analysis containing the median dissolved solids for the group located in section 24 of Township 3 north, Range 8 west were selected to represent the area.

The actual number of analytical results available depended on the parameter. For example, there were 1,036 complete analyses for which total dissolved solids could be calculated and trace metal data extracted. However there were 1,151 samples collected for nitrate and about 1,070 samples for chloride. Parameters were often reported as "less than detection" at various detection limits and 50 percent of the reported detection limit was used in data evaluation.

Maximum contaminant levels (MCLs) or secondary maximum contaminant levels (SMCLs) are cited for various parameters below. MCLs refer to the maximum level of a constituent allowed in public drinking water supplies as established by EPA (see http://www.epa.gov/safewater/mcl.html) and are set to ensure that the contaminant does not pose significant risk to public health. MCLs are legally enforceable standards that apply to public water systems.

SMCLs are non-enforceable guidelines for contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water.

Total Dissolved Solids: About 50 percent of the 1,036 samples for which total dissolved solids were reported contained concentrations greater than 500 mg/L. More than 470 of these samples were from consolidated rock aquifers located east of the Rocky Mountains and around the edges of intermontane valleys in western Montana; 340 of these samples were from unconsolidated aquifers in the valleys of western Montana and along major drainages in eastern Montana. More than 90 percent of samples from unconsolidated aquifers contained less than 500 mg/L dissolved solids and none contained more than 2,000 mg/L. In contrast, only about 20 percent of the samples from consolidated rock aquifers contained less than 500 mg/L dissolved solids but 24 percent contained more than 2,000 mg/L.

Nitrate: The nitrate (as N, nitrate-nitrogen) data represents results from 1,151 water samples. About 15 percent of all samples contained nitrate concentrations of less than 0.25 mg/L, and about 80 percent of all samples contained concentrations of less than 2 mg/L. About 90 percent of all samples contained less than 5 mg/L. However, 4 percent of the samples contained concentrations greater than 10 mg/L. The median nitrate concentration for all samples was 0.26 mg/L. The median concentration in samples from unconsolidated aquifers was 0.51 mg/L and the median concentration for samples from consolidated aquifers was 0.25 mg/L. Table 34 summarizes the nitrate data.

Table 34. Nitrate-nitrogen concentrations in 1,151 samples

Nitrate-nitrogen mg/L	Unconsolidated aquifers	Percent	Consolidated aquifers	Percent	All aquifers	Percent
<0.25	72	13	96	16	168	15
>=0.25 and <2.0	338	63	417	68	755	66
>=2.0 and <5.0	69	13	52	8	121	11
>=5.0 and <10.0	35	7	28	5	63	5
>=10.0	24	4	20	3	44	4
Totals	**538**	**100**	**613**	**100**	**1151**	**101***

*Rounding causes total to be greater than 100 percent

There were 538 nitrate-nitrogen results available for samples from unconsolidated aquifers and 613 results from consolidated rock aquifers. There was little difference between unconsolidated and consolidated aquifers in the numbers of samples that had nitrate concentrations of less than 2 mg/L. More samples from unconsolidated aquifers had concentrations greater than 2 mg/L than did from consolidated aquifers. The numbers of samples containing 10 mg/L or more of nitrate from unconsolidated and consolidated aquifers were about equal.

Fluoride: Analytical results for fluoride in 1,033 samples showed that concentrations were between 0.1 and 2.0 mg/L in about 90 percent of the samples. However, at concentrations greater than 2 mg/L (50 percent of the MCL) water from consolidated rock aquifers generally contained more fluoride than did water from unconsolidated aquifers. Twenty percent of the samples from consolidated rock aquifers exceeded 2.0 mg/L; whereas only about 2 percent of the water samples from unconsolidated aquifers contained similar concentrations. The MCL was exceeded in 1 percent of the samples from unconsolidated aquifers and 6 percent of the samples from consolidated rock aquifers.

Sulfate: Sulfate is rarely absent in groundwater. Only about 6 percent of the samples did not contain detectable concentrations. About 30 percent of the 1,038 samples contained sulfate concentrations greater than the secondary drinking water standard of 250 mg/L. Fifty-six percent of the samples contained sulfate concentrations of less than 125 mg/L (50 percent of the secondary standard).

Water samples from unconsolidated aquifers had lower sulfate concentrations than did samples from consolidated rock aquifers. One hundred percent of the samples from unconsolidated aquifers contained sulfate concentrations of less than 125 mg/L, whereas only 20 percent of the water samples from consolidated rock aquifers contained sulfate concentrations below that level. None of the samples from unconsolidated aquifers contained sulfate concentrations greater than 250 mg/L, but 56 percent of the samples from consolidated aquifers exceeded the secondary standard.

Chloride: In about 90 percent of the 1,067 samples, chloride concentrations were less than 63 mg/L (25 percent of the secondary standard of 250 mg/L), but only about 6 percent of the samples did not contain detectable chloride. Only 1 percent of the samples from unconsolidated aquifers and 3 percent of the samples from consolidated rock aquifers contained greater than 250 mg/L chloride. Chloride is commonly present at low concentrations in natural water and the secondary standard is high compared to chloride concentrations in most of the samples.

About 50 percent of the samples contained chloride concentrations of less than 10 mg/L. About 40 percent of the samples contained more than 10 mg/L, but less than 63 mg/L of chloride. The median concentration of chloride for all the samples was 9.5 mg/L. The median concentration in unconsolidated aquifers was about 8.3 mg/L and the median concentration in consolidated rock aquifers was about 11.1 mg/L.

Metals: About 1,115 analyses included trace metals. Table 35 summarizes results for metals with primary or secondary MCLs. Only aluminum, arsenic, lead, and selenium were present in concentrations above their MCLs, but only in 1 to 7 percent of the samples. The percentage of samples that contained concentrations of any metal between the detection limit and 50 percent of the MCL or SMCL, ranged from 66 percent for lead to 100 percent for copper and zinc.

Table 35. Distribution of sampling results based on MCLs established for various trace metal concentrations in public drinking water supplies.

	MCL µg/L	Total Samples	Samples with either a reported value or a non-detect <= the MCL or SMCL	Percent samples below 50% MCL	Percent >50% MCL and <100% MCL	Percent >100% MCL
Aluminum*	50 (s)	1015	843	90.9	5.3	3.8
Arsenic	10 (p)	994	978	73.1	19.9	7.0
Chromium	100 (p)	1014	1014	98.4	1.6	0.0
Copper	1,000 (s)	1016	1016	100.0	0.0	0.0
Lead	10 (p)	992	890	66.1	33.4	0.6
Nickel	100 (p)	1015	1015	99.8	0.1	0.1
Selenium	50 (p)	1015	999	97.4	1.2	1.4
Silver	50 (p)	890	889	100.0	0.0	0.0
Zinc	5,000 (s)	1014	1014	99.6	0.2	0.2

*Aluminum has been associated with discoloration of drinking water following treatment and the SMCL is sometimes given as a range between 50 and 200 mg/L to allow states to address local conditions. The 50 µg/L minimum was used here for comparison purposes. (p) = primary drinking water standard. (s) = secondary drinking water standard. Acceptable detection limits (µg/L): Al = 10-50, As = 2-10, Cr = 2-100, Cu = 2-50, Pb = 2-10, Ni = 2-40, Se = 1-20, Ag = 1-20, Zn = 2-40. Non-detect results with detection limits above the MCL or SMCL were not included.

Arsenic: Based on 978 samples, almost all of Montana's groundwater contains arsenic, but 93 percent of the samples contain arsenic concentrations less than 10 µg/L. Table 36 shows that the arsenic distribution does not vary widely between consolidated and unconsolidated aquifers and also shows that 26 percent of the samples from unconsolidated aquifers and 35 percent of the samples from consolidated aquifers contained concentrations of more than 3 µg/L.

Table 36. Arsenic concentrations in 978 samples.

Arsenic µg/L	Unconsolidated aquifers	Percent	Consolidated aquifers	Percent	All aquifers	Percent
< 1	162	37	182	34	344	35
>= 1 and < 3	166	37	165	31	331	34
>= 3 and < 10	81	18	154	29	235	24
>= 10 and < 25	26	6	27	5	53	5
>= 25 and < 50	3	1	4	1	7	1
>= 50	5	1	3	1	8	1
Total	**443**	**100**	**535**	**101***	**978**	**100**

*Rounding causes total to be greater than 100 percent

Radon: Radon in water results from samples collected between August 1992 and September 2004 provide data for radon concentrations in groundwater. One hundred fifty-two of the 665 samples were collected since July 1, 2001. About 80 percent of Montana's groundwater contains radon concentrations greater than 300 pCi/L. Almost 90 percent of the samples contained concentrations less than 2,000 pCi/L. The frequency distribution did not vary widely between consolidated rock and unconsolidated aquifers although the highest radon concentrations occurred in water from igneous intrusive rock aquifers such as the Boulder Batholith in southwestern Montana. Frequency distributions for the radon results compared to proposed MCLs of 300 and 4,000 pCi/L are in Table 37 and Table 38.

Table 37. Radon concentration distribution based on a 300 pCi/L proposed MCL.

Radon pCi/L	Unconsolidated aquifers	Percent	Consolidated aquifers	Percent	All aquifers	Percent
<50	5	1	6	2	11	2
>50 and <150	14	3	23	3	37	6
>150 and <300	40	10	36	7	76	11
>300	350	86	191	88	541	81
Total	**409**	**100**	**256**	**100**	**665**	**100**

Table 38. Radon concentration distribution based on a 4,000 pCi/L proposed MCL.

Radon pCi/L	Unconsolidated aquifers	Percent	Consolidated aquifers	Percent	All aquifers	Percent
<500	119	29	104	41	223	34
>500 and <2000	256	63	111	43	367	55
>2000 and <4000	24	6	18	7	42	6
>4000	10	2	23	9	33	5
Total	**409**	**100**	**256**	**100**	**665**	**100**

D.2 Groundwater Protection Programs

Groundwater Management Strategy

Protection Strategy

The level of effort at DEQ for groundwater protection through public awareness and education is less than that for surface water and wetlands. This is a concern because groundwater supplies drinking water for most public and private users in Montana and because contaminated groundwater is very difficult to clean up. The rate and scale of ground water impacts are increasing for several reasons. These include the increasing use of septic systems associated with growth and development and increased agricultural use of groundwater for irrigation and livestock watering due to basin closures for surface water rights. Increased groundwater use for irrigation and livestock watering can potentially reduce recharge and increase the impacts from fertilizers, pesticides, and animal wastes to groundwater as these pollutants move through the soil and ultimately end up in groundwater.

The need to develop a management strategy to protect Montana's groundwater has been widely recognized for at least the past two decades. A planning committee has met at various times over the past 15 years to discuss management strategies for protecting and conserving groundwater in Montana. Wide-ranging scope, goals, agency reorganizations, and personnel changes have complicated this process. In 1992, the Department of Natural Resource Conservation (DNRC) released the Montana Water Plan. They, with the assistance of other State agencies, elaborated on one of the key sections, Integrated Water Quality & Quantity Management, resulting in the Montana Ground Water Plan, which the DNRC released in 1999.

Several DEQ bureaus and other State agencies, as part of their daily business, address many of the strategies laid out in the 1999 Ground Water Plan. However, a major recommendation laid out by the Ground Water Plan stated that: State agencies with groundwater programs should regularly evaluate the adequacy and effectiveness of their groundwater protection programs and submit the results of these evaluations to the Environmental Quality Council. Beginning in 2001, the Environmental Quality Council should review these evaluations and publish a summary report every four years.

As of 2005, there is no overall coordination of groundwater stewardship and protection activities within Montana. Implementation of groundwater protection strategies is still fragmented between multiple agencies. DNRC has recently (summer 2005) begun efforts to identify stakeholders, update the groundwater plan, and coordinate the groundwater strategy.

Remediation Strategy

The DEQ Remediation Division is responsible for overseeing investigation and cleanup activities at state and federal Superfund sites; reclaiming abandoned mine lands; implementing corrective actions at sites with leaking underground storage tanks; and overseeing groundwater remediation at sites where agricultural and industrial chemicals have caused groundwater contamination. The purpose of these activities is to protect human health and the environment; to prevent exposure of potential human and ecological receptors to hazardous or deleterious substances that these sites release to soil, sediment, surface water, or groundwater; and to ensure compliance with applicable state and federal regulations.

The Groundwater Remediation Program regulates these sites under the Montana Water Quality Act (WQA). These sites typically require long-term soil, surface water, and/or groundwater remediation and monitoring. This program addresses sites that the Leaking Underground Storage Tank Program, Comprehensive Environmental Cleanup and Responsibility Act (CECRA) Program, Permitting and Compliance Division, or other state authorities do not address.

The Groundwater Remediation Program has overseen remediation at sites contaminated with petroleum, pesticides, and solvents. Sites range from small (not on National Priority List [NPL]) to large (on NPL) in scale. The program ranks sites as maximum, high, medium, or low priority sites, or as operation and maintenance sites.[90] Currently, the Groundwater Remediation Program is addressing 74 sites. The Groundwater Remediation Program works cooperatively with the Department of Agriculture when pesticides affect groundwater.

Source Water Protection

Montana is required under provisions of the 1996 federal Safe Drinking Water Act to carry out a Source Water Assessment Program (SWAP). A SWAP provides technical assistance to Public Water Supplies (PWS). The EPA formally approved Montana's program in November 1999. Directing Montana's source water protection (SWP) is the responsibility of the SWP Section of DEQ.

Section 1453 of the Safe Drinking Water Act (42 U.S.C. § 300j-13) requires the state program to:

1. Identify the source(s) of water used by PWSs
This process delineates capture zones for wells or a stream buffer area for surface water sources called the source water protection area.

2. Identify and Inventory Potential Contaminant Sources
Potential significant contaminant sources within the source water protection area are identified. Regulated contaminants of concern in Montana generally include nitrate, microbial contaminants, solvents, pesticides, and metals. Potential sources of these types of contaminants include septic systems, animal feeding operations, underground storage tanks, floor drains, sumps, and certain land use activities.

3. Assess the Susceptibility of the PWS to those identified potential contaminant sources
A susceptibility assessment considers the hazard rating of a potential contaminant source and potential barriers to evaluate the likelihood that a spill or release would reach the well or intake. A determination of susceptibility will be made for each identified potential contaminant source within the source water protection area.

4. Make the results of the delineation and assessment available to the public
Source water assessments must be made available to the public. Different resources will be used to bring this information to the public including consumer confidence reports, SWP Internet site, posting at public libraries, posting at local health department, and others.

a. Delineation and assessments will be compiled into a map and text report for each PWS.

b. Assistance is available for PWSs to help them use the delineation and assessment report to develop local source water protection plans. Participation in this part of the program will remain voluntary.

c. The program is applicable to all public water systems.

Implementation of SWP takes several forms in Montana, ranging from recognizing a PWS's protection strategy to certification of a source water protection plan (SWPP). When a PWS concurs with their Source Water Delineation and Assessment Report (SWDAR), the SWP section recognizes that the PWS has an established protection strategy. This demonstrates the PWS has acknowledged the assessed level of susceptibility, and recognizes management actions they can take to reduce susceptibility. If a PWS needs to take an action in order to reduce susceptibility, they have acknowledged by their concurrence that they are susceptible and they have acknowledged the existence of, or need for barriers. Where susceptibility is low, a PWS may not need to take an action for continued protection of the source and yet are considered to have a protection strategy in place. However, when all significant potential contaminant sources identified in the source water assessment cause higher than moderate susceptibility of the drinking water source to a significant potential contaminant source the SWP Section defines that PWS as "Substantially" implementing a SWP strategy.

[90] Montana Department of Environmental Quality (US) [DEQ]. Cleaning Up Montana – Superfund Accomplishments 1983 – 1996 [online document]. Helena, MT: DEQ, Remediation Division; 1996. Available from: http://www.deq.mt.gov/rem/PDFs/Superfund_Booklet.pdf. Accessed 2005 November 11.

SWP developed these implementation definitions since they tie directly to the process of assessing susceptibility according to a hazard rating tempered by barriers. It is measurable and will be reportable through a database query. Using SWP's definitions, the DEQ may consider a PWS to be implementing a protection strategy without explicitly taking an action. This is acceptable in some Montana settings where thoughtful well field selection or aquifer conditions are such that protection is achieved when the well is constructed. The SWP program includes a 5-year inventory update so that changing conditions affecting susceptibility are addressed.

Additionally, a PWS may elect to complete a SWPP, and have the SWP program certify the plan. This process involves adding to and enlarging the scope of the SWDAR, and incorporating elements such as emergency and contingency planning. Due to the voluntary nature of the program and the considerable time and expense required to complete a plan, DEQ has certified relatively few SWPPs. Currently, the primary incentive for completing a SWPP is to eliminate the filtration requirement for a spring or surface water source. DEQ is currently considering a requirement for a certified SWPP in advance of granting PWS water quality-monitoring waivers.

Local Water Quality Districts

Local Water Quality Districts (LWQD) are established to protect, preserve, and improve the quality of surface water and groundwater within the district. Currently there are four in Montana. Lewis and Clark County established the state's first LWQD in 1992, covering the Helena Valley watershed. A year later, Missoula County set up a LWQD covering the Missoula Valley Sole Source Aquifer. Butte/Silver Bow established a LWQD in 1995. Gallatin County formed a LWQD covering the Gallatin Valley at Bozeman in 1997. Additionally, local groups in Yellowstone, Flathead, and Ravalli counties have expressed interest in forming LWQDs.

LWQD are formed pursuant to 7-13-4501 et. Seq., MCA by county governments. This legislation describes district organization and specifies local-level authorities. The DEQ provides support to LWQD programs, but does not have an active management role in their activities. These groups serve as local government districts with a governing board of directors, and funding obtained from fees collected annually with county taxes, similar to funding mechanisms for other county districts.

The districts must prepare an annual report that summarizes the yearly activities. These reports provide a review of the ongoing activities and allow for an assessment of each LWQD in meeting their program objectives established during formation of the districts. A staff member with the DEQ Source Water Protection Section serves as coordinator for LWQD activities, and reviews the annual reports.

A significant component of selected district programs is the ability to participate in the enforcement of the Montana Water Quality Act and related rules. Districts also may develop and implement local water quality protection ordinances, which they perform in conjunction with the Enforcement Division at DEQ.

DEQ is working with the districts to support implementation of the SWP Program at PWS systems within district boundaries. DEQ's LWQD coordinator participates annually in the process of planning for a meeting with all the districts to review programs and activities, and generally share ideas about how each district approaches and manages local water quality related issues.

Prevention of Agriculture Chemical Pollution

The Montana Department of Agriculture (MDA) Groundwater program has the responsibility of protecting groundwater and the environment from impairment or degradation due to the use or misuse of agricultural chemicals (pesticides and fertilizers).

The program ensures the proper and correct use of agricultural chemicals; the management of agricultural chemicals to prevent, minimize, and mitigate their presence in groundwater; and provides education and training to agricultural chemical applicators, dealers and the public on groundwater protection, agricultural chemical use and the use of alternative agricultural methods. The program was formed in 1989 and is comprised of groundwater monitoring, education, management plan development, and enforcement.

The MDA is also responsible for the Generic Management Plan (GMP) for the state. The GMP is an umbrella plan, the purpose of which is to provide guidance for the state to prevent groundwater impairment from agricultural chemicals (pesticides and fertilizers—including pesticide and fertilizer use that is not directly related to agriculture). Copies may be obtained by request from the Agricultural Sciences Division of the MDA.

Groundwater Monitoring & Education

The MDA conducts ambient groundwater monitoring for agricultural chemicals. The groundwater monitoring program's purpose is to determine whether residues of agricultural chemicals are present in groundwater and to assess the likelihood of an agricultural chemical entering groundwater. If agricultural chemicals are found in groundwater, the MDA is tasked to verify, investigate, and determine an appropriate response to the findings. The department also has an education program under which they conduct initial and re-certification training for commercial and government pesticide applicators. The department staff is available to provide or assist in training and education for the public regarding pesticides.

Groundwater Monitoring

Permanent monitoring wells serve as the foundation from which the MDA looks for current and new agricultural chemicals. The MDA selects sites to be representative of agricultural crops and cropping, as well as their associated pesticide usage. Monitoring wells are located in the following counties: Beaverhead, Blaine, Broadwater, Carbon, Chouteau, Daniels, Dawson, Glacier, Hill, Judith Basin, Lake, McCone, Pondera, Richland, Teton, Valley, Wheatland and Yellowstone. The department also evaluates new chemicals when labeled for use in Montana as analytical methods are established.

Fairfield Bench

In 2002, a review of monitoring data on the Fairfield Bench (Teton and Cascade Counties, Sun River Watershed) determined that criteria necessary to implement a Specific Management Plan (SMP) for Imazamethabenz-methyl in groundwater had been met, per 4.11.1206 of the Administrative Rules of Montana. In 2005 an evaluation of the SMP concluded that the conditions necessary for mitigation of Imazamethabenz-methyl on the Fairfield Bench had been achieved, and the SMP was repealed in 2006.[91]

Statewide Groundwater/Pesticide Projects

The MDA Groundwater Program is in its second year of performing statewide groundwater/pesticide characterization projects. The MDA will prioritize watersheds around the state in which to conduct one-year monitoring projects. The Department selects sites based on agricultural setting, soil type, groundwater table, and sampling availability of the wells. These projects provide a snapshot of pesticide and nitrate levels in the groundwater, usually associated with a surface water source such as a river system. In 2005, the Department of Agriculture received a grant from EPA to sample the groundwater along the Yellowstone River Valley for pesticides and nitrates.[92] This Lower Yellowstone River Project sampled 22 wells twice during 2005. Wells sampled for this project were located in agricultural settings from Stillwater County to Richland County. The wells are predominantly located within two miles of the Yellowstone River. In 2006, the Department of Agriculture completed the Gallatin Valley Project, which consisted of 26 groundwater wells and 3 surface water sites in the Belgrade, Bozeman, Manhattan, and surrounding area.[93]

Groundwater Enforcement Program

The MDA is responsible for primary enforcement of the Montana Agriculture Chemical Ground Water Protection Act. The DEQ is responsible for adopting water quality standards for agricultural chemicals (pesticides and fertilizers). The MDA ensures compliance by conducting statewide comprehensive inspections at agricultural chemical users, dealers, and manufacturers, by collecting groundwater and soil samples, and by investigating and monitoring incidents and spills that could cause impairment. Where necessary, the MDA implements compliance actions and orders to prevent or remediate agricultural chemical groundwater problems.

---

[91] Bamber, A. Personal Interview. Discussion to clarify the Department of Agriculture's comments on the 2006 Montana Integrated 303(d)/305(b) Water Quality Report (21 November 2006).
[92] Yellowstone River Valley Project – 2005 [Internet]. Helena, MT: Montana Department of Agriculture; (n.d.). Available from: http://agr.mt.gov/pestfert/groundwater/gwyellowstonereport.asp. Accessed 2006 November 16.
[93] Bamber, A. Personal Interview. Discussion to clarify the Department of Agriculture's comments on the 2006 Montana Integrated 303(d)/305(b) Water Quality Report (14 November 2006).

D.3 Groundwater-Surface Water Interactions

The Surface Water Treatment Rule (SWTR) was introduced in the 1986 provisions of the federal Safe Drinking Water Act. Surface water sources, or sources influenced by surface water, are subject to additional treatment requirements (i.e. filtration). The SWTR required each state to assess all PWS that utilize groundwater to determine whether surface waters influence the water source. The DEQ performed these assessments, under a project known as the Groundwater Under the Direct Influence of Surface Water (GWUDISW) program.

Evidence of surface water influence on groundwater was defined under SWTR as:

- Significant occurrence of insects or other macroorganisms, algae, or large diameter pathogens such as *Giardia lamblia*, or Cryptosporidium; or
- Significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH, that closely correlates to climatological or surface-water conditions.

The initial step in the GWUDISW program is completion of a preliminary assessment (PA). The PA scores the source based on the source location relative to surface water bodies and information provided on the driller's log. Accordingly, large numbers of wells far removed from any surface water failed the PA due to lack of a well log. The DEQ completed further assessment on sources that failed the PA. In some instances, the DEQ retained the MBMG to perform a detailed hydrogeologic assessment. These assessments were contracted primarily for spring sources or other complex hydrogeologic situations, in which a detailed study was warranted.

DEQ's evolving database does not currently provide discrete tracking of the GWUDISW program. As of 2005, DEQ has completed roughly 90% of the preliminary assessments. The MBMG completed approximately 45 hydrogeologic assessments on systems that failed the preliminary assessment.